

US Application No.	:	N/A (filed herewith)
International Application No.	:	PCT/KR2005/000324
Applicant	:	YUN, JANGSHIK
TC/A.U.	:	N/A
Examiner	:	N/A
Attorney Docket	:	2017-75
Customer No.	:	52706

---

Mail Stop PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

#### **PRELIMINARY AMENDMENT**

Dear Sir or Madam:

Applicant hereby submits a preliminary amendment together with the PCT National Stage Application, as referenced above.

**Amendments to Specification** begin on **page 2** of this paper.

**Amendments to Claims** begins on **page 8** of this paper.

**Remarks** begin on **page 13** of this paper.

**Replacement drawing sheet** attached on the **last page** of this paper.

## AMENDMENTS TO SPECIFICATION

Please amend **paragraph 37 of Page 6** to:

“As shown in Fig.1 and Fig.6, an impeller shaft 435 and disposed inside of a shroud 420 at a gas suction inlet 431, a bearing 434 supported with a an impeller shaft 435 for a centrifugal impeller 408, an over driver 436 installed on an electric motor 433, a liquid atomizer 403 and a grill 400 disposed on the front of a body 407 a gas-liquid centrifugal separator 407 through a gas suction duct 405, a liquid tank 401 disposed with a liquid atomizer 403 through a venturing tube 402, a gas passage cylinder 413 disposed for fastening an electric motor 433 inside of a body 407 a gas-liquid centrifugal separator 407, gas passage holes 450 formed on the circumference side of a gas passage cylinder 413, a separate plate 460 installed inside of a gas passage cylinder 413, a liquid drain plate 424 is installed on the bottom of a gas exhaust cylinder 413, a first liquid drain holes 422 formed on a liquid drain plate 424, a second liquid drain holes 423 formed on a liquid drain plate 424, a liquid drain vessel 419 disposed on the bottom of a gas passage cylinder 413, a frain room formed inside of a liquid drain vessel 419, a liquid drain trap 441 disposed on the bottom of a liquid drain vessel 419 through a liquid drain pipe 411, and a first vortex room 504 provided annually inside of a housing 409, a second vortex room 506 provided inside of a gas passage cylinder 413; and a gas-liquid centrifugal separator 407 used for a dehumidification apparatus as an accessory parts in complex type air cleaner or air condition system.”

Please amend **Paragraph 44 of Page 8** to:

“As shown in Fig.10, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a gas-liquid centrifugal separator for disposing an electric motor outside of a gas-liquid centrifugal separator, comprising: an electric motor 433 installed on the outside of a body 407 a gas-liquid centrifugal separator 407, an over driver 436 connected with an electric motor 433, an impeller shaft 435 rotatably fixed with an over driver 436, a centrifugal impeller 408 rotatably fixed on an impeller shaft 435, and a bearing 434 supported for a centrifugal impeller 408 on a gas passage cylinder 413.”

Please amend **Paragraph 46 of Page 8** to:

“As shown in Fig.12, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a body 407 a-gas-liquid-centrifugal-separator for scrubbing dust and harmful gases at a remote distance, comprising: a flexible hose 604 connected with a liquid atomizer 401 in the front of an gas-liquid centrifugal separator 407 through a gas inlet duct 405.”

Please amend **Paragraph 47 of Page 8** to:

“As shown in Fig.13, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a gas-liquid centrifugal separator for cleaning the exhaust gas of chimney in industrial facility, comprising: a vortex cleaning room 703A disposed in the front of a body 407 a-gas-liquid-centrifugal-separator 407 through a gas suction duct 405, and a liquid atomizer 703 connected with a vortex cleaning room 703A through a pipe, an air blower 794 connected with a vortex cleaning room 703A through a pipe for operating an air-liquid jet nozzle, and a liquid supply pump 796 connected with a vortex cleaning room 703A through a liquid pipe, a liquid tank 701 connected with a liquid supply pump 796 through a liquid pipe, a liquid circulate pump 792 connected with a liquid tank 701 through a liquid pipe, a liquid cleaner 790 connected with a liquid circulate pump 792 through a liquid pipe, a liquid drain trap 441 connected with a liquid cleaner 790.”

Please amend **Paragraph 48 of Page 8 to 9** to:

“As shown in Fig.14, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and air-liquid centrifugal separator for cleaning the suction air of a turbo charger in an automobile engine, comprising: a body 807 an air-liquid-centrifugal separator 807 disposed with a grill 800 at the air inlet of an engine, a centrifugal impeller 808 supported with a bearing 834 inside of a body 807 a-an-air-liquid-centrifugal separator 807, a turbine 833A connected with a centrifugal impeller 808 through an impeller shaft 835, a liquid atomizer 803 disposed in the front of an air-liquid centrifugal separator 807 through an air suction duct 805, an air passage cylinder 813 disposed inside of a body 807 an air-liquid-centrifugal separator 807, several air passage holes 850 formed on the circumference side of an air passage cylinder 813, a clean air outlet 832

installed on the side of an air passage cylinder 813, a liquid drain plate 824 is installed on the bottom of a gas exhaust cylinder 813, a first liquid drain holes 922 formed on a liquid drain plate 824, a second liquid drain holes 823 formed on a liquid drain plate 824, a liquid drain trap 841 installed on the bottom of a liquid drain vessel 819, and a first vortex room 804 formed annually inside of a housing 809, a second vortex room 806 formed inside of an air passage cylinder 813, and a liquid filter 890 connected with a liquid drain trap 841 through a liquid pipe 891, a circulate pump 892 connected with a liquid filter 890 through a liquid pipe 891, a liquid tank 801 connected with a circulate pump 892 through a liquid pipe 891, a liquid atomizer 803 connected with a liquid tank 801 through a liquid pipe 891.”

Please amend **Paragraph 49 of Page 9** to:

“As shown in Fig.15, with a bearing 934 inside of a body 907 a gas-liquid centrifugal separator 907, a turbine 933A connected with a centrifugal impeller 908 through an impeller shaft 935, a liquid atomizer 903 disposed in the front of a gas-liquid centrifugal separator through an exhaust gas suction duct 905, a gas passage cylinder 913 located inside of a gas-liquid centrifugal separator, several gas passage holes 950 formed on the circumference side of a gas passage cylinder 913, a clean gas outlet 932 installed on the side of a gas exhaust cylinder 913, a liquid drain plate 924 is installed on the bottom of a gas exhaust cylinder 913, a first liquid drain holes 922 formed on a liquid drain plate 924, a second liquid drain holes 923 formed on a liquid drain plate 924, a liquid drain vessel 919 disposed on the bottom of a gas passage cylinder 913, a liquid drain trap 941 installed on the bottom of a liquid drain vessel 919, and a first vortex room 904 formed annually in a housing 909, a second vortex room 906 formed inside of an exhaust gas passage cylinder 913, and a liquid filter 990 connected with a liquid drain trap 941 through a liquid pipe 991, a liquid circulate pump 992 connected with a liquid filter 990 through a liquid pipe 991, a liquid tank 901 connected with a circulate pump 992 through a liquid pipe 991, a liquid atomizer 903 connected with a liquid tank 901 through a liquid pipe 991.”

Please amend **Paragraph 56 of Page 11** to:

“As shown in Fig.5, a gas passage cylinder 413 is formed with spiral grooves 416 on the outside circumference surface for improving the effect of centrifugal vortex gas stream along spiral grooves 416 and for passing downward separated liquid containing pollution substances with the labyrinth effect at a 1<sup>st</sup> vortex room 504 inside of a housing 409. Wherein vortex gas stream is formed along spiral grooves 416 on the basis of the labyrinth effect. Also spiral grooves 416 formed on the surface of a gas passage cylinder 413 for generating vortex stream of wet gas on the basis of labyrinth effect and separating washing water from gas on the basis of centrifugal force.”

Please amend **Paragraph 57 of Page 11** to:

“As shown in Fig.6, a grill 400 usually called 'pre filter' is disposed in the front of a body 407 a gas-liquid centrifugal separator 407 for preventing large grain in gas, and atomizer 403 is disposed for scrubbing pollution substances including fine particle(less than 0.010) of dust, bacteria, virus, mist, mite, cigarette smoke, harmful gas with atomizing liquid, especially natural water(H<sub>2</sub>O), also a liquid tank 401 may be used with adding scrubbing chemicals in liquid in the special case of pollution substances in gas, Wherein the atomization means of an atomizer 403 may be operated with various type including aerodynamic venturing tube, ultrasonic vibration, and gas-liquid nozzle with blower or compressor.”

Please amend **Paragraph 58 of Page 12** to:

“Therefore a centrifugal impeller 408 is rotated with the power of an electric motor 433 inside of a gas-liquid centrifugal separator 407, a gas stream is passed in a liquid atomizer 403 through a gas suction duct 405 via a grill 400, Further an ultra sonic humidifier, a centrifugal humidifier, a high pressure water sprayer, a high frequency humidifier, a steam humidifier, a heating humidifier, an evaporative humidifier, an electronic humidifier, and a two fluid nozzle sprayer may be used as a liquid atomizer 403 and then liquid, especially water is atomized or sprayed by the aerodynamic pressure from a liquid tank 401 through venturing tube 402 as indicated by the arrows, also atomization controller 402 is provided for adjusting the quantity of liquid atomization,

wherein the numerous atomizing liquid droplets as in the flow of fog or mist may be formed with centrifugal vortex flow for effectively scrubbing the pollution substances of gas in gas suction duct 405. Further a scrubbing room 406 located on the gas suction duct 405 for scrubbing gas pollutants with the stream of a fine particular liquid mist, as shown in Fig. 6. Wherein the pollution substances of gas are scrubbed efficiently with the viscous cohesion of liquid mist or fine aqua droplets in the three-dimensional cubic vortex flow as in a form of fog or mist."

Please amend **Paragraph 59 of Page 12** to:

"Further, As shown in Fig.1, the gas stream mixed with the atomized liquid droplets is flowed inside of a body 407 a gas-liquid centrifugal separator 407 through a gas suction inlet 431 and gas suction duct 405 with the suction power of centrifugal impeller 408 rotating by the power of electric motor 433 as indicated by the arrows, further an axial fan, a climbed fan and a sirocco fan may be used as a centrifugal impeller 408 for suctioning the stream of the wet air. thus the mixed gas-liquid stream is formed as centrifugal vortex stream after passing a liquid atomizer 403 through a gas suction duct 405. thus the mixed gas-liquid stream is distributed evenly with the inlet structure of spiral grooves 416, as indicated by the arrows as shown in Fig.5, thus it is formed with a centrifugal vortex gas stream along spiral grooves 416 on the basis of the labyrinth effect, meanwhile separated liquid including pollution substances is passed downward at a 1<sup>st</sup> vortex room 504 between the spiral grooves 416 and the inner wall of a housing 409. Wherein a gas suction inlet 431 is connected with a gas suction duct 405 through a fastener 492."

Please amend **Paragraph 79 of Page 18** to:

As shown in Fig.14 is a perspective view of another embodiment for an automobile turbo charger suction air purification apparatus according to the present invention, a body 807 an air-liquid centrifugal separator 807 is disposed with a suction grill 800 on the air inlet of an automobile internal engine, a centrifugal impeller 808 is supported with a bearing 834 above a separate pale 860 at an air suction inlet 831 inside of a housing 809, a centrifugal impeller 808 connected with a turbine 833A in an exhaust

gas pipe 804 of engine through an impeller shaft 835, a liquid atomizer 803 and a grill 800 installed on the front of ~~a body 807 an air-liquid centrifugal separator 807~~ through an air suction duct 805, an air passage cylinder 813 is disposed inside of an air-liquid centrifugal separator 807, several air passage holes 850 is formed on the circumference side of an air passage cylinder 813, an air exit pipe duct 832 is installed on the side of an air passage cylinder 813, a first liquid drain holes 822 is formed on the bottom of an air passage cylinder 813, a liquid drain vessel 819 is disposed on the bottom of an air passage cylinder 813, a liquid drain trap 841 is installed on the bottom of a liquid drain vessel 819, and a first vortex room 804 is provided annually inside of a housing 809, a second vortex room 806 is provided inside of an air passage cylinder 813, and a liquid filter 890 is connected with a liquid drain trap 841 through a pipe, a liquid circulate pump 892 is connected with a liquid filter 890 through a pipe, a liquid tank 801 is connected with a liquid circulate pump 892 through a pipe, a liquid atomizer 803 is connected with a liquid tank 801 through a liquid pipe 802 as an Wet type air cleaner utilizing a centrifugal for cleaning suction air of turbo charger.”

Please amend **Paragraph 92 of Page 22** to:

“Finally wet type air cleaner utilizing a centrifugal impeller according to the present invention may be installed and operated with a complex air cleaner or air conditioning system for utilizing gas-liquid centrifugal separation efficiency. Further a body 407 utilizing for an auxiliary parts in a dehumidifier of compressed air system, refrigerative air conditioner, constant temperature and humidity controller.

## AMENDMENTS TO CLAIMS

Claims 1-13. (canceled)

Claim 14. (new)      Wet type air cleaner utilizing a centrifugal impeller comprising: a body 407 in which a centrifugal impeller 408 rotates the sucked air, to which a housing and a gas passage cylinder 413 are mounted so that a vortex having a centrifugal force lengthwisely passes by a predetermined distance, the body 407 having an annular first vortex room formed between the housing 409 and the gas passage cylinder 413 and a second vortex room 506 formed in the gas passage cylinder 413; a gas suction duct 405 mounted to the front side of the body 407, through which air is moved; and a liquid tank 401 communicated with the gas suction duct 405, for supplying the washing water to the gas suction duct 405 from a liquid atomizer 403 through a venturi tube 402, wherein the contaminated substances in the air introduced through the gas suction duct 405 are collected by using the washing water and the air is purified by centrifugal separation by using the difference between the specific gravities of the air and the washing water.

Claim 15. (new)      A wet type air cleaner as claimed in claim 14, comprising: a body 407 having a separation plate 460 provided in the interior thereof, a motor 433 fixed to an upper portion of the separation plate 460, a centrifugal impeller 408 installed at the motor 433 so as to be rotated through a bearing 434 and a rotational shaft 435, a gas passage cylinder 413 to which the motor 433 and the bearing 434 are fixed in the housing 409, a plurality of openings 450 formed on the circumferential surface of the gas passage cylinder 413, a clean gas outlet 432 installed at an lower portion of the gas passage cylinder 413, a water discharging opening 423 installed at a lower portion of the gas passage cylinder 413, a water discharging tube 419 located at a lower portion of the air discharging tube 424, a trap 441 installed through a water discharging opening 411 at a lower portion of the water discharging tube 419, an annular first vortex room formed between the housing 409 and the gas passage cylinder 413 so that a vortex having a centrifugal force lengthwisely passes by a predetermined distance, and a second vortex room 506 formed in the gas passage cylinder 413, wherein a liquid atomizer 403 is

mounted to the venturi tube 402 and a protection grill 400 is provided at an inlet opening of the gas suction duct.

**Claim 16. (new)** A wet type air as claimed in claim 14, comprising: spiral grooves 416 formed on the outside surface of a gas passage cylinder 413 for generating vortex stream of wet gas on the basis of labyrinth effect and separating washing water from gas on the basis of centrifugal force.

**Claim 17. (new)** A wet type air as claimed in claim 14, comprising: an over driver 436 utilized with the various transfer means including an oil surface friction transmission, a gear transmission et al. for increasing the rotation speed of a centrifugal impeller 408.

**Claim 18. (new)** A wet type air cleaner as claimed in claim 14, comprising: a scrubbing room 406 located on the gas suction duct 405 for scrubbing gas pollutants with the stream of a fine particular liquid mist.

**Claim 19. (new)** A wet type air cleaner as claimed in claim 14, comprising: an axial fan, a climbed fan and sirocco as a centrifugal impeller 408 for suctioning the stream of the wet air.

**Claim 20. (new)** A wet type air cleaner as claimed in claim 14, comprising: a body 407 utilizing for an auxiliary parts in a dehumidifier of compressed air system, refrigerative air conditioner, constant temperature and humidity controller.

**Claim 21. (new)** A wet type air cleaner as claimed in claim 14, comprising: a humidity controller 442 installed on a clean gas outlet 432 for adjusting the humidity of fresh gas.

**Claim 22. (new)** A wet type air cleaner as claimed in claim 14, comprising: a liquid atomizer 403 utilized with the various atomizing means including a venturing tube, an ultra sonic vibration generator, and an air-liquid jet nozzle et al. , and a liquid atomizer

403 installed with a liquid circulation pump disposed from a liquid drain trap 441 to a liquid tank 401 through a liquid pipe, and a liquid atomizer 403 installed with vortex generating means for generating a strong vortex stream of fine liquid droplet inside of gas suction duct 405.

Claim 23. (new) A wet type air cleaner as claimed in claim 14, comprising: a centrifugal impeller 408 utilized with a turbine impeller for generating centrifugal vortex stream in a gas-liquid centrifugal separator 407.

Claim 24. (new) A wet type air cleaner as claimed in claim 14, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a gas-liquid centrifugal separator for disposing an electric motor outside of a gas-liquid centrifugal separator, comprising: an electric motor 433 installed on the outside of a gas-liquid centrifugal separator 407, an over driver 436 connected with an electric motor 433, an impeller shaft 435 rotatably fixed with an over driver 436, a centrifugal impeller 408 rotatably fixed on an impeller shaft 435, and a bearing 434 supported for a centrifugal impeller 408 on a gas passage cylinder 413.

Claim 25. (new) A wet type air cleaner as claimed in claim 14, comprising: an impeller shaft 435 formed with an gas passage inside for passing a clean gas through inside of a shaft.

Claim 26. (new) A wet type air cleaner as claimed in claim 25, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a gas-liquid centrifugal separator for scrubbing dust and harmful gases at a remote distance, comprising: a flexible hose 604 connected with a liquid atomizer 401 in the front of an gas-liquid centrifugal separator 407 through a gas inlet duct 405.

Claim 27. (new) A wet type air cleaner as claimed in claim 14, Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and a gas-liquid centrifugal separator for cleaning the exhaust gas of chimney in industrial facility, comprising: a

vortex cleaning room 703A disposed in the front of a gas-liquid centrifugal separator 407 through a gas suction duct 405, and a liquid atomizer 703 connected with a vortex cleaning room 703A through a pipe, an air blower 794 connected with a vortex cleaning room 703A through a pipe for operating an air-liquid jet nozzle, and a liquid supply pump 796 connected with a vortex cleaning room 703A through a liquid pipe, a liquid tank 701 connected with a liquid supply pump 796 through a liquid pipe, a liquid circulate pump 792 connected with a liquid tank 701 through a liquid pipe, a liquid cleaner 790 connected with a liquid circulate pump 792 through a liquid pipe, a liquid drain trap 441 connected with a liquid cleaner 790.

Claim 28. (new) A wet type air cleaner as claimed in claim 14, comprising: a liquid atomizer and air-liquid centrifugal separator for cleaning the suction air of a turbo charger in an automobile engine, comprising: an air-liquid centrifugal separator 807 disposed with a grill 800 at the air inlet of an engine, a centrifugal impeller 808 supported with a bearing 834 inside of a an air-liquid centrifugal separator 807, a turbine 833A connected with a centrifugal impeller 808 through an impeller shaft 835, a liquid atomizer 803 disposed in the front of an air-liquid centrifugal separator 807 through an air suction duct 805, an air passage cylinder 813 disposed inside of an air-liquid centrifugal separator 807, several air passage holes 850 formed on the circumference side of an air passage cylinder 813, a clean air outlet 832 installed on the side of an air passage cylinder 813, a liquid drain plate 824 is installed on the bottom of a gas exhaust cylinder 813, a first liquid drain holes 922 formed on a liquid drain plate 824, a second liquid drain holes 823 formed on a liquid drain plate 824, a liquid drain trap 841 installed on the bottom of a liquid drain vessel 819, and a first vortex room 804 formed annually inside of a housing 809, a second vortex room 806 formed inside of an air passage cylinder 813, and a liquid filter 890 connected with a liquid drain trap 841 through a liquid pipe 891, a circulate pump 892 connected with a liquid filter 890 through a liquid pipe 891, a liquid tank 801 connected with a circulate pump 892 through a liquid pipe 891, a liquid atomizer 803 connected with a liquid tank 801 through a liquid pipe 891.

Claim 29. (new) Wet type air cleaner utilizing a centrifugal impeller with a liquid atomizer and gas-liquid centrifugal separator for cleaning exhaust gas from automobile engine, comprising: a gas-liquid centrifugal separator connected with an exhaust gas pipe 904 of an engine, a centrifugal impeller 908 supported with a bearing 934 inside of a gas-liquid centrifugal separator, a turbine 933A connected with a centrifugal impeller 908 through an impeller shaft 935, a liquid atomizer 903 disposed in the front of a gas-liquid centrifugal separator 907 through an exhaust gas suction duct 905, a gas passage cylinder 913 located inside of a gas-liquid centrifugal separator 907, several gas passage holes 950 formed on the circumference side of a gas passage cylinder 913, a clean gas outlet 932 installed on the side of a gas exhaust cylinder 913, a liquid drain plate 924 is installed on the bottom of a gas exhaust cylinder 913, a first liquid drain holes 922 formed on a liquid drain plate 924, a second liquid drain holes 923 formed on a liquid drain plate 924, a liquid drain vessel 919 disposed on the bottom of a gas passage cylinder 913, a liquid drain trap 941 installed on the bottom of a liquid drain vessel 919, and a first vortex room 904 formed annually in a housing 909, a second vortex room 906 formed inside of an exhaust gas passage cylinder 913, and a liquid filter 990 connected with a liquid drain trap 941 through a liquid pipe 991, a liquid circulate pump 992 connected with a liquid filter 990 through a liquid pipe 991, a liquid tank 901 connected with a circulate pump 992 through a liquid pipe 991, a liquid atomizer 903 connected with a liquid tank 901 through a liquid pipe 991.

Remarks

Applicant has amended specification to basically rename reference numerals 407 and 807 so as to read *a body 407 and body 807*, respectively. Applicant believes the other modification in this specification is for better understanding of his invention.

Applicant has rewritten claims, believing the claim amendment has been made within the scope of the original claims.

Applicant has prepared a Replacement Drawing Sheet attached thereto to replace fourth drawing sheet of the original, where a new reference numeral 406 is added for *scrubbing room*. The applicant believes this drawing amendment will better disclose his invention.

Applicant now respectively requests a timely examination of the PCT national stage application in consideration of this preliminary amendment.

Respectively submitted,

IPLA P.A.

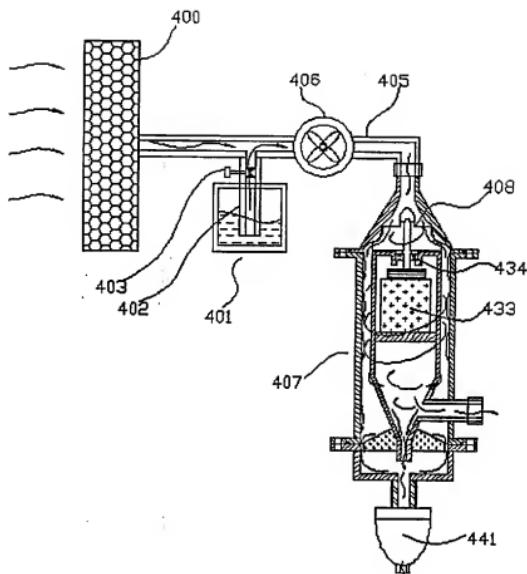
Date: April 20, 2006

/James E. Bame/

James E. Bame  
Regis. No. 44521  
Tel: 213-637-5633

REPLACEMENT SHEET

[Fig. 6]



[Fig. 7]

